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ABSTRACT

Cognitive cause maps permit a topological investigation of the complexity of organizational events and behaviors. Because cognitive cause maps are believed to be ordered according to a givens-means-ends schema, they contain information about an individual's motivation structure. In a work setting an individual engages in several different acts. Each of these acts is pushed by an occasion and pulled by an outcome. In this model, the greater the push and pull on an act relative to other acts, the greater the tendency to engage that act. This model was tested in a university mailing center. Subjects (N=35) were mailing service employees who completed surveys on attributes of supervision, coworkers, the work itself, the individual, and job behaviors. Results generally supported the push-pull model of organizational behavior. The model and study results address three concerns of organizational scientists. First, the model recognizes that behavior and cognition in organizations is multidimensional, variable, and integrated. Second, the model suggests how the patterning and content of a cognitive cause map may covary with, and predict, patterning in behavior. Third, the study analysis presented a strategy permitting both idiographic and nomothetic interpretation of behavior and cognition in organizations. Several tables and figures are included. (ABL)

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PREDICTING BEHAVIOR FROM COGNITIVE CAUSE MAPS OF A WORK SETTING

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PREDICTING BEHAVIOR FROM COGNITIVE
CAUSE MAPS OF A WORK SETTING

Abstract

The model and data presented in this paper address three concerns of organizational scientists. First, the model recognizes that behavior and cognition in organizations is multidimensional, variable, and integrated. Second, the model suggests how the patterning and content of a cognitive cause map may covary with, and predict, patterning in behavior. Third, the method of analysis presents a strategy that permits both idiographic and nomothetic interpretation of behavior and cognition in organizations. Data from 35 employees of a mailing service are offered in support of the model.

PREDICTING BEHAVIOR FROM COGNITIVE CAUSE MAPS OF A WORK SETTING

The dependent variable in much of organizational research has been individual performance unidimensionally defined (Staw & Oldham, 1978; Rosse & Miller, 1984). American pragmatism may be behind the focus on end-result and bottom line behaviors (Cummings, 1978), but we miss the mark if we attend to behaviors in isolation. People in organizations not only produce goods and services, they also socialize, daydream, take breaks, work overtime, innovate, schmooze, sabotage, volunteer, and engage a multitude of other activities. Organizationally relevant behavior is not simply productivity but the entire distribution in kind, sequence, and duration of recurring and isolated acts that each individual in his or her unique, but systematic, way brings to the organization. The model and empirical evidence presented in this paper offer an approach to the description and prediction of complex behavior patterns in organizations.

Cognitive cause maps (Bougon, Weick, & Binkorst, 1977) permit a topological investigation of the complexity of organizational events and behaviors (Figure 1). Because cognitive cause maps are believed to be ordered according to a givens-means-ends schema, Bougon (1980) has suggested they contain information about an individual's motivation structure. Neither Bougon (1980), nor Weick (1979), however, have been explicit about how the interconnected causality beliefs that compose cause maps predict, or covary with, behavior. The task undertaken here is to suggest a relation that connects the structure and content of a cognitive cause map with a distribution of efforts in an organizational setting.

The specific problem in linking a cause map with behavior consists in establishing a relation between the array of cognitions represented in a map and an array of behaviors. One approach to this problem is to start by considering the structure of beliefs surrounding just one behavior (eg. a mini-map, Figure 2). In Figure 2, for example, we note that "the amount of resources provided by my supervisor" is perceived to influence "the quantity of work I do" which is perceived to influence "the amount I am paid." The relations in this, or any, mini-map can be summarized as follows:

Occasion(s) ---- Act ---- Outcome(s).

If the outcomes associated with an act are assumed to have some value, valence, or utility attached to them, the diagram above illustrates two determinants of action, a push and a pull. An act is pushed by the occasion and pulled by the value of the outcome. As suggested earlier an individual engages several different acts in the work setting. Each of these acts, following the above statement, is pushed by an occasion and pulled by an outcome. It is argued here that the greater the push and pull on an act relative to other acts the greater the tendency to engage that act. Unlike a stimulus-response model of behavioral organization the pull on an act suggests anticipation of some future state. Unlike an expectancy-value model of behavioral organization the push on an act suggests an array of stimuli as an impetus to action.

A more formal statement of the pull effects on an act is achieved by recognizing its resemblance to expectancy models of decision making

(Edwards, 1954), attitudes (Fishbein & Ajzen, 1975), and motivation (Vroom, 1964; Naylor, Pritchard, & Ilgen, 1980). The hypothesized relations among the pull on an act, cause beliefs, and valences are stated with the following formulation:

$$pull_j = \sum_{k=1}^{m} (w_k \; v_k)$$

where: $pull_j$ is the resolution of the activating and inhibiting actions of the beliefs and valences associated with act j, w_k is the sign and strength of the belief that act j influences variable k, and v_k is the valence of variable k.

If a cognitive weighting process analogous to the processes outlined in expectancy theories is assumed, the effect of push on action can be described as a function of the influences on the act and the intensity of the influencing variables. For example, an organization participant may perceive that the amount of resources provided by his or her supervisor has a weak, moderate, or strong influence on the quantity of work he or she produces. In addition, the participant may perceive that the amount of resources provided is small, moderate, or large. The hypothesized relations among push, beliefs, and intensities is stated with the following formulation:

$$push_j = \sum_{i=1}^{n} (w_i \; i_i)$$

where: $push_j$ is the resolution of the activating and inhibiting actions of the beliefs and intensities on act j, w_i is the sign and the strength of the belief

that variable i influences act j, and i_i is the intensity of variable i.

A combining of the push and pull formulations results in the following statement:

$$\text{action tendency}_j = b_1(\text{push})_j + b_2(\text{pull})_j$$

where: action tendency$_j$ is the resolution of the activating and inhibiting forces of push and pull on act j, b_1 and b_2 are the relative weights of the push and pull forces, and push and pull are as defined earlier.

In general terms the above formulation suggests that an act, as initiated from an action tendency, is a function of both the occasion for the act and the outcome of the act. More simply, behavior is initiated by its antecedents and sustained by its consequences.

There is a close parallel between what was described above as complex behavior patterns and behavior as described by Naylor et al. (1980). "Behavior...will be viewed as a problem of resource allocation on the part of the individual in which he or she has a wide variety of options available at any moment with regard to possible acts that can be performed (have resources allocated to them) and the amount of resources, which may or should be allocated to each option or act." (p. 6) Knowledge of an individual's relative action tendencies should be useful for predicting how an individual allocates his or her resources in a particular situation. Specifically, the following hypothesis is offered:

H: The magnitudes of action tendencies, as derived from the push-pull action tendency formulation, for a set of acts within a context, predict the relative allocation of an individual's time and effort to the acts associated with the action tendencies.

Method

Participants

Forty-four employees of a mailing service for a large Midwestern university participated in a "Survey of Work Environments." The mailing center provided three services to the university: preparation of bulk mailings, delivery of intra-campus mail, and the running of a warehouse for the university book publisher. Forty-one of the employees participated in all phases of the data collection. Thirty-five of the 41 completed surveys were usable. The average age of the participants was 36.5 years; the youngest and oldest were 20 and 66 years of age. Approximately half were males, and approximately half indicated they were married. Only three indicated that they worked part-time for the mailing service. On average, salaries from the mailing service provided 70% of family income.

Variables and Data Collection

The variables that constitute a cause map are sampled from a concept-structure. In the Bougon et al. (1977) study variables were obtained through naturalistic observation, discussion, and interviews. For the present investigation five classes of variables were chosen in consultation with other industrial/organizational psychologists as relevant to both organizational members and organizational researchers:

1) attributes of supervision, 2) attributes of coworkers, 3) attributes of the work itself, 4) attributes of the individual, and 5) job behaviors. This resulted in a total of 25 variables, 15 of which were attributes of the work setting or the individual, and 10 of which were job behaviors (Table 1).

Data were collected in three phases over an eight week period. In the first phase, approximately two weeks in duration, semantic differential adjectives identified by Osgood, May, and Miron (1975) as representing cross-cultural good-bad and potency dimensions of semantic meaning were used to assess the participants' evaluation of the valence and intensity of each of the 25 variables (see Figure 3 for a sample of the questionnaire).

In the second phase, approximately four weeks in duration, participants were asked through a questionnaire which of 25 variables influenced which other of the 25 variables. They were to indicate if a variable influenced another variable, and, if so, whether an increase in the first variable led to an increase or decrease in the second variable (see Figure 4 for a sample of the questionnaire). This was done for all possible combinations of variables. From this information the influences on and the influences of each behavior can be assessed, and a topographical representation of a cause map can be created for each individual (Figure 1).

In the third phase, approximately two weeks in length, the amplitude and duration (Campbell & Pritchard, 1976) of each individual's behaviors were assessed for each of the ten behaviors described earlier by rating the "time and effort" (Naylor et al., 1980) an individual devoted to each behavior compared to other behaviors. This method of rating provides

ipsative measures appropriate for within-person analysis. The behaviors were evaluated from three perspectives, the individual's, the individual's immediate supervisor, and the head of the mailing center.

Analyses

Both idiographic and nomothetic interpretations of the data were desired. To achieve this end a two stage analytic strategy was employed. In stage one within-person ipsative correlations and regressions were calculated for each of the individuals in the study. Such a procedure literally results in personal equations for each of the 35 participants. Interpretations at this stage are idiographic. The procedure in stage two was to consider the probability of the vectors of correlations, beta weights, and regressions across the 35 individuals in the study. Such a procedure sees each individual as an independent study and uses the techniques of combining results of independent studies (Rosenthal, 1978), and the techniques of meta-analysis of research studies (Hunter, Schmidt, & Jackson, 1982). A test outlined by Rosenthal (1978), testing the mean $\underline{Z}$, was used to inspect the vectors of correlation and regressions coefficients. To estimate effect sizes means were calculated for the correlation and regression coefficients across the 35 individuals using Fisher's $\underline{z}'$ (Cohen & Cohen, 1975). Interpretations at this stage are nomothetic.

Results

Participant #14 is offered as an example of idiographic analysis. Figure 1 displays this individual's cause map. To illustrate how push and pull can be assessed from the data Figure 5 isolates three behaviors for this individual along with the perceived antecedents and consequences of these behaviors and their intensities and valences. Note that some

variables may be perceived as both antecedents and consequences. Table 2 summarizes the relations between push + pull and behavior for this participant. The correlations of push and pull with ratings of behavior by self and by immediate supervisor are reliable at or beyond the .05 level of probability. The multiple R's of push + pull with rating of behavior by self, immediate supervisor, and organization head were .77, .66, and .51. Although these are relatively large multiple R values only the rating by self was statistically reliable because the number of observed behaviors for each individual is limited to ten. Table 3 presents the relations between push + pull and ratings of behavior by the immediate supervisor for all 35 participants. For five individuals the correlations between push and behavior are reliable at or beyond the .05 level of probability. For eleven individuals the correlation between pull and behavior are reliable. For four individuals the multiple R for push + pull with behavior is reliable. Similar patterns are obtained across the 35 individuals for ratings by self and ratings by the organizations head. For ratings by self, 17 of the multiple Rs are reliable, and for ratings by the organization head, 7 of the multiple Rs are reliable. To conserve space the data for each individual on ratings by self and ratings by the organization head are not presented.

The results appropriate for nomothetic interpretation are presented in Table 4. The table displays the probabilities of the vectors of correlations, multiple Rs, and standardized beta weights across the 35 individuals in the study. Only the vector of standardized beta weights for push with behavior rating by immediate supervisor fails to achieve an acceptable level of statistical reliability. All other vectors are reliable at or beyond the .01 level of probability. The mean multiple Rs

of push + pull with ratings of behavior by self, immediate supervisor, and organization head are .75, .55, and .57. In general, the results of the analyses support the hypothesized relations.

Discussion

The model and empirical analyses presented in this paper contribute to our understanding of individuals in organizations in three ways. First, the model recognizes that behavior and cognition in organizations is multidimensional, variable, and integrated. Second, the model suggests how the patterning and content of a cognitive cause map may covary with, and predict, patterning in behavior. Third, the method of analysis presents a strategy that permits both idiographic and nomothetic interpretation of behavior and cognition in organizations.

In general we can conclude that the structure of mind as revealed in participant cause maps is attached to multidimensional behavior in organizations, and that this behavior is embedded in a plexus of events characterized by multiple causes and effects. Future research should verify the robustness on the relations detected here. If these relations prove to be relatively robust future research might next consider how changes in cognitive cause maps influence behavior, and conversely how changes in behavior influence cognitive cause maps.

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Table 1

Variables in participants' cognitive cause maps

Attributes of Supervision	
"the concern my supervisor shows for group members"	(N)
"the emphasis my supervisor places on meeting goals"	(W)
Attributes of Coworkers	
"the friendliness of my coworkers"	(R)
"the help coworkers give me with my work"	(U)
"the expectations of people I work with"	(V)
"the acceptance I get from people I work with"	(J)
Attributes of Job	
"the pay I receive"	(A)
"the opportunities I have for promotion"	(B)
"the enjoyment I get from my work"	(I)
"the variety in my work"	(X)
"the equipment and facilities I have to do my job"	(Y)
"the security I have in my job"	(C)
Attributes of Self	
"the expectations I have for myself"	(M)
"the skills and abilities I have"	(Q)
"the personal growth and development I get from my work"	(D)
Job Behaviors	
"the quality of work I do"	(E)
"the quantity of work I do"	(F)
"the help I give coworkers"	(G)
"the overtime I work"	(H)
"the cooperation I give my supervisor"	(K)
"the improvement I make in my skills and abilities"	(L)
"the number of days I get to work on time"	(O)
"the attempts I make to change things at work"	(P)
"the goofing off I do at work"	(S)
"the talking I do with coworkers"	(T)

Table 2

Relation between push + pull and ratings of behavior by self, immediate supervisor, and organization head for participant #14

	Self		Immediate Supervisor		Organization Head	
	Relation	(t prob)	Relation	(t prob)	Relation	(t prob)
Push with Rating -- r	.76	(<.01)	.63	(.03)	.80	(.12)
Pull with Rating -- r	.71	(.01)	.63	(.03)	.50	(.06)
Push + Pull -- Multiple R	.77	(.04)	.66	(.14)	.51	(.35)
Push Standardized B	.58	(.18)	.33	(.28)	-.09	(.55)
Pull Standardized B	.26	(.29)	.35	(.26)	.58	(.19)

Table 3

Relation between push + pull and ratings of behavior by immediate supervisor for 35 participants

PERSON	PUSH with RATING r	(t prob)	PULL with RATING r	(t prob)	MULT R	(F prob)	PUSH STAND BETA	(t prob)	PULL STAND BETA	(t prob)
1	-.05	(.56)	.16	(.33)	.26	(.79)	-.26	(.70)	.33	(.25)
2	.30	(.20)	.##*	(.10)	.46	(.43)	.15	(.34)	.38	(.16)
3	-.06	(.57)	-.1#	(.65)	.19	(.88)	.26	(.37)	-.37	(.68)
4	.05	(.##)	.50	(.07)	.63	(.17)	-.50	(.88)	.83	(.0#)
5	.5#	(.05)	.81	(.12)	.55	(.29)	.50	(.15)	.06	(.45)
6	.21	(.28)	.62	(.03)	.63	(.17)	-.13	(.65)	.69	(.0#)
7	.28	(.22)	.83	(.11)	.##	(.47)	.11	(.39)	.38	(.18)
8	.23	(.21)	.76	(.01)	.79	(.03)	-.26	(.81)	.92	(.01)
9	.68	(.02)	.07	(.83)	.70	(.10)	.70	(.02)	.17	(.27)
10	-.09	(.60)	.56	(.0#)	.62	(.18)	-.28	(.80)	.65	(.0#)
11	.2#	(.25)	.30	(.20)	.32	(.69)	.11	(.81)	.2#	(.29)
12	.27	(.22)	.36	(.15)	.37	(.60)	-.10	(.56)	.45	(.25)
13	.#6	(.09)	.63	(.02)	.6#	(.15)	-.22	(.66)	.81	(.08)
1#	.63	(.03)	.63	(.03)	.66	(.1#)	.33	(.28)	.35	(.27)
15	.33	(.1#)	.90	(<.01)	.90	(<.01)	-.03	(.56)	.92	(<.01)
16	.18	(.31)	.13	(.36)	.21	(.86)	.#5	(.3#)	-.29	(.61)
17	.50	(.07)	.75	(.01)	.77	(.0#)	.19	(.26)	.66	(.02)
18	.25	(.25)	.29	(.21)	.36	(.61)	.22	(.28)	.26	(.2#)
19	-.27	(.77)	-.12	(.63)	.29	(.7#)	-.38	(.75)	.15	(.39)
20	.18	(.31)	.52	(.06)	.55	(.27)	-.26	(.73)	.69	(.07)
21	.36	(.15)	.71	(.01)	.72	(.07)	.13	(.32)	.67	(.02)
22	.20	(.29)	.21	(.28)	.22	(.85)	.07	(.#6)	.15	(.#1)
23	.5#	(.05)	.65	(.02)	.71	(.09)	.31	(.17)	.51	(.07)
2#	.#6	(.09)	.#5	(.09)	.50	(.36)	.28	(.27)	.27	(.28)
25	.##	(.10)	.71	(.01)	.75	(.05)	-.##	(.83)	1.07	(.02)
26	.05	(.##)	.35	(.16)	.#0	(.55)	-.22	(.69)	.#8	(.15)
27	-.07	(.57)	.39	(.13)	.#3	(.#8)	-.20	(.70)	.#5	(.12)
28	.12	(.37)	.##	(.10)	.#5	(.#6)	-.09	(.59)	.#8	(.12)
29	.#3	(.11)	.#6	(.09)	.#7	(.#2)	-.38	(.60)	.83	(.29)
30	.37	(.15)	.#3	(.11)	.5#	(.29)	.3#	(.16)	.#0	(.12)
31	.56	(.0#)	.51	(.07)	.63	(.17)	.#2	(.12)	.31	(.19)
32	.5#	(.05)	.#2	(.12)	.57	(.25)	.#5	(.12)	.20	(.29)
33	.33	(.17)	.73	(.01)	.7#	(.06)	.07	(.#0)	.71	(.02)
3#	.50	(.07)	.36	(.15)	.50	(.36)	.58	(.16)	-.10	(.57)
35	-.0#	(.55)	.35	(.16)	.#2	(.50)	-.27	(.75)	.#8	(.13)

Table 4

Mean relations and vector Z probabilities for push + pull with ratings of behavior by self, immediate supervisor, and organization head across 35 participants

	Self		Immediate Supervisor		Organization Head	
	Mean	(Z prob)	Mean	(Z prob)	Mean	(Z prob)
Push with Rating — r	.66	(<.01)	.29	(<.01)	.36	(<.01)
Pull with Rating — r	.53	(<.01)	.47	(<.01)	.35	(<.01)
Push + Pull — Multiple R	.75	(<.01)	.55	(<.01)	.57	(<.01)
Push Standardized B	.39	(<.01)	.05	(.16)	.17	(<.01)
Pull Standardized B	.30	(<.01)	.43	(<.01)	.27	(<.01)

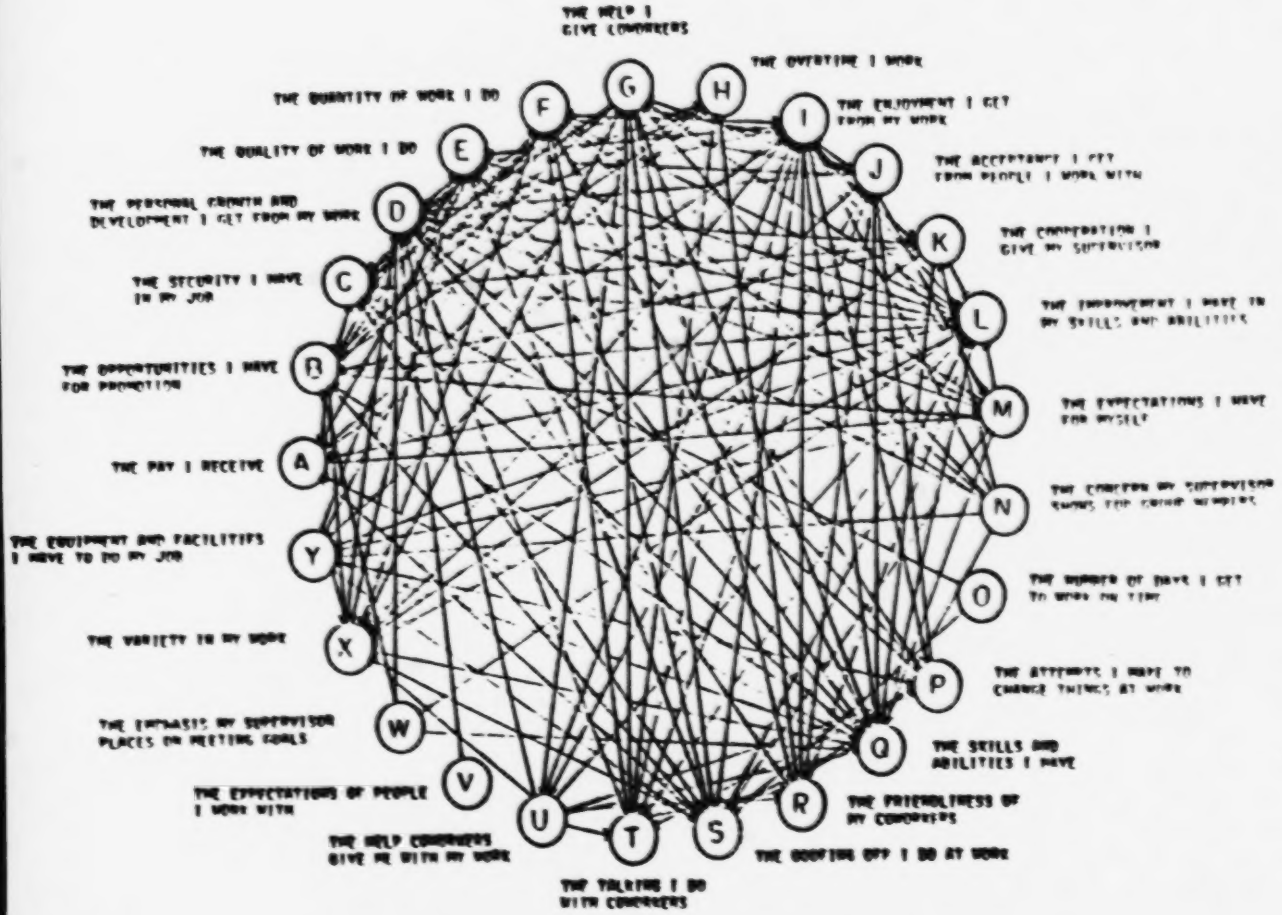
THE HELP I GIVE COWORKERS
THE OVERTIME I WORK
THE QUANTITY OF WORK I DO
THE ENJOYMENT I GET FROM MY WORK
THE QUALITY OF WORK I DO
THE ACCEPTANCE I GET FROM PEOPLE I WORK WITH
THE PERSONAL GROWTH AND DEVELOPMENT I GET FROM MY WORK
THE COOPERATION I GIVE MY SUPERVISOR
THE SECURITY I HAVE IN MY JOB
THE IMPROVEMENT I MAKE IN MY SKILLS AND ABILITIES
THE OPPORTUNITIES I HAVE FOR PROMOTION
THE EXPECTATIONS I HAVE FOR MYSELF
THE PAY I RECEIVE
THE COOPERATION MY SUPERVISOR GIVES THE COWORKERS
THE EQUIPMENT AND FACILITIES I HAVE TO DO MY JOB
THE AMOUNT OF TIME I GET TO WORK ON TIME
THE VARIETY IN MY WORK
THE ATTEMPTS I MAKE TO CHANGE THINGS AT WORK
THE EMPHASIS MY SUPERVISOR PLACES ON MEETING GOALS
THE SKILLS AND ABILITIES I HAVE
THE EXPECTATIONS OF PEOPLE I WORK WITH
THE FRIENDLINESS OF MY COWORKERS
THE HELP COWORKERS GIVE ME WITH MY WORK
THE QUALITY OF WORK I DO AT WORK
THE TALKING I DO WITH COWORKERS
A
B
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Figure 1.

Cause map for participant #14.

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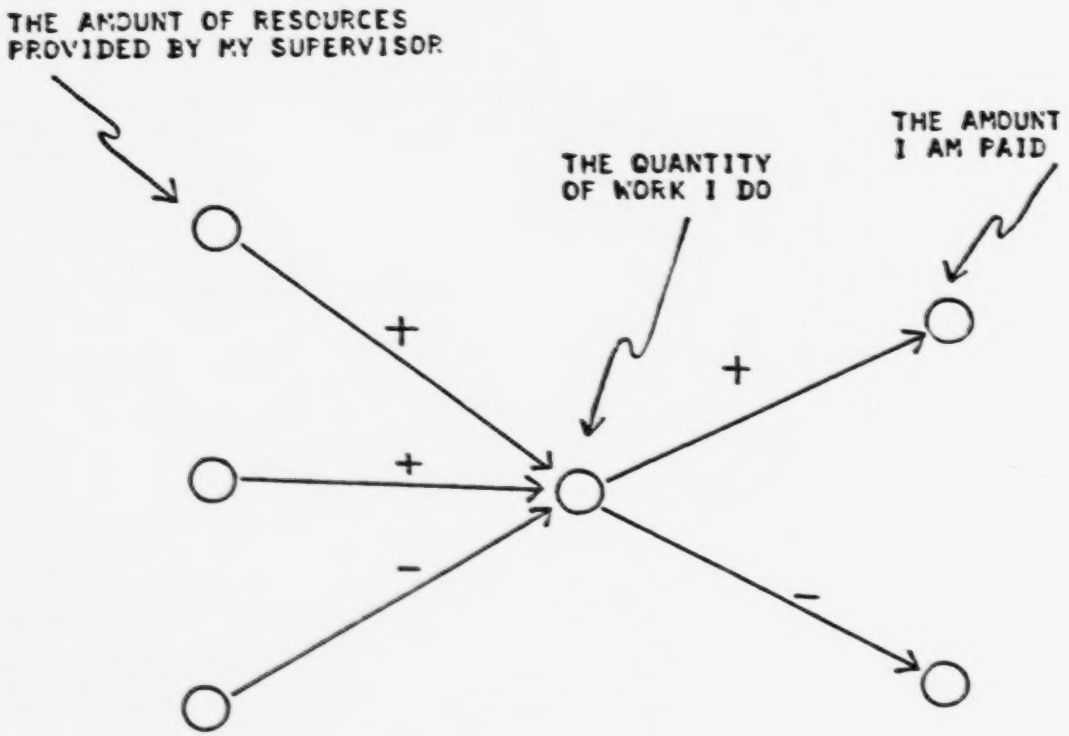

Figure 2.

An example of a behavior and its relation with other variables (mini-map).

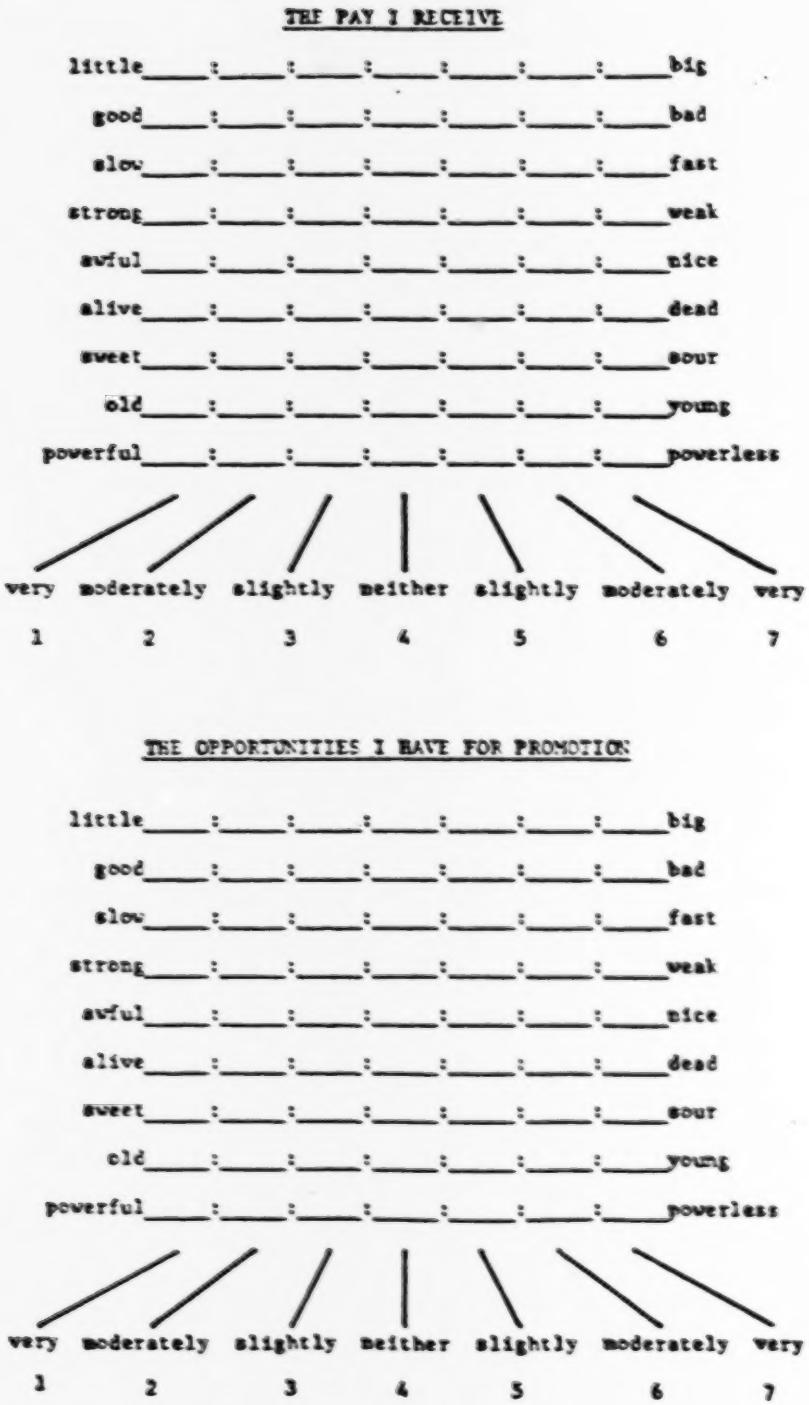
THE PAY I RECEIVE
little : : : : : : big
good : : : : : : bad
slow : : : : : : fast
strong : : : : : : weak
awful : : : : : : nice
alive : : : : : : dead
sweet : : : : : : sour
old : : : : : : young
powerful : : : : : : powerless
very moderately slightly neither slightly moderately very
1 2 3 4 5 6 7
THE OPPORTUNITIES I HAVE FOR PROMOTION
little : : : : : : big
good : : : : : : bad
slow : : : : : : fast
strong : : : : : : weak
awful : : : : : : nice
alive : : : : : : dead
sweet : : : : : : sour
old : : : : : : young
powerful : : : : : : powerless
very moderately slightly neither slightly moderately very
1 2 3 4 5 6 7

Figure 3.

Sample of questionnaire measuring affect, activity, and potency dimensions of sematic meaning for cause map variables.

Yes or no?	If yes -- An increase in the help I give coworkers increases/decreases...	(Circle one)		(If yes, circle one)	
The help I give coworkers influences	the pay I receive.	yes	no	increases	decreases
	the opportunities I have for promotion.	yes	no	increases	decreases
	the security I have in my job.	yes	no	increases	decreases
	the personal growth and development I get from my work.	yes	no	increases	decreases
	the quality of work I do.	yes	no	increases	decreases
	the quantity of work I do.	yes	no	increases	decreases
	the overtime I work.	yes	no	increases	decreases
	the enjoyment I get from my work.	yes	no	increases	decreases
	the acceptance I get from people I work with.	yes	no	increases	decreases
	the cooperation I give my supervisor.	yes	no	increases	decreases
	the improvement I make in my skills and abilities.	yes	no	increases	decreases
	the expectations I have for myself.	yes	no	increases	decreases
	the concern my supervisor shows for group members.	yes	no	increases	decreases
	the number of days I get to work on time.	yes	no	increases	decreases
	the attempts I make to change things at work.	yes	no	increases	decreases
	the skills and abilities I have.	yes	no	increases	decreases
	the friendliness of my coworkers.	yes	no	increases	decreases
	the goofing off I do at work.	yes	no	increases	decreases
	the talking I do with coworkers.	yes	no	increases	decreases
	the help coworkers give me with my work.	yes	no	increases	decreases
	the expectations of people I work with.	yes	no	increases	decreases
	the emphasis my supervisor places on meeting goals.	yes	no	increases	decreases
	the variety in my work.	yes	no	increases	decreases
	the equipment and facilities I have to do my job	yes	no	increases	decreases

Figure 4.

Sample of questionnaire assessing perceived influence relations among cause map variables.

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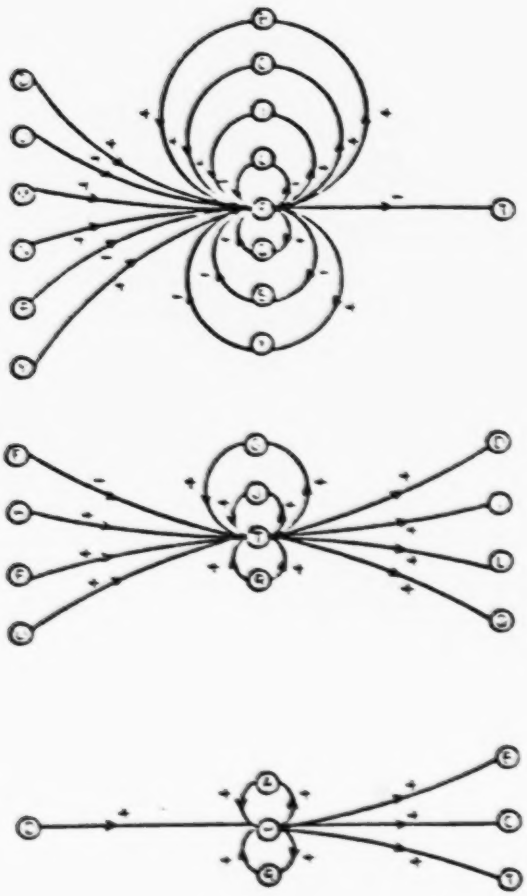

VARIABLE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
INTENSITY	11	6	12	11	11	11	10	11	11	10	12	12	9	12	12	3	12	10	2	6	5	11	11	5	9
AFFECT	2	-2	4	5	5	3	4	3	5	4	6	5	3	5	6	-4	3	1	0	3	3	3	4	4	2

F-"THE QUANTITY OF WORK I DO"
T-"THE TALKING I DO WITH COWORKERS"
H-"THE OVERTIME I WORK"

Figure 5.

The perceived antecedents and consequences of 3 behaviors for participant #14.